

**Colleen's
Human Factors Performance Plan
Draft 4**

This document is the program plan for the human factors specialists for FY 03. It contains a break down of all of the major activities, milestones, timelines, and products. This is intended to be a living document which will be updated periodically.

Roles & Responsibilities:

Currently Human Factors Specialists at FAA HQ are primarily involved in two types of activities:

1. Developing policy (requirements and guidelines) for new avionics systems (typically through industry consensus documents such as RTCA MOPS, which are invoked by TSOs) and
2. Providing support of certification projects (ACO's) for which no policy exists, but policy is being (or should be) developed.

The activities to support these two primary tasks fall into two major categories: those that directly support CNS and those that are more cross cutting.

Summary of Human Factors Projects That Colleen Has Been Asked to Support

This section contains a list of key policy (Regulations, Advisory Circulars, TSOs, and Orders) as well as other key database projects which are currently being supported and anticipated to be supported throughout FY 03. Items resulting in Regulations and AC's are listed first.

<u>Type of Document</u>	<u>Topic</u>	<u>Focal Point</u>	<u>Project #</u>
1. Regulation & AC	Alerting (25.1322)	Donovan	1
2. Regulation & AC	Human Factors (25.1301- sub-paragraph e)	Donovan	2
3. TSO & MOPS	Moving Map With Ownship	Donovan	6
4. Order	Addressing Human Factors for Avionics as part of the TSO process (8100 series)	Donovan	7
5. Policy Memo & MOPS	Weather Displays	Donovan	12
6. HF Roadmap	NEXCOM	Donovan	13

Projects not being supported

1. Multi-function display TSO Revision	2. CPDLC Tech Center Research (Rehmann work)	3. EFIS Part 23 Cert/ Standardization
4. Night Vision Gog. (NVG)	5. SC-189 Safety Assessment	6. ANM & ACE Roles & Responsibilities document
7. Synthetic Vision	8. AIR HF WEB page	9. AC 23.1523
10. RTCA SC-194		

Project Details

Project 1: Alerting (25.1322) Regulation and AC (Donovan)

This activity is part of the Avionics ARAC Harmonization Working Group activity. The group was tasked with harmonizing the FAA/JAA regulation on Alerting (25.1322) and associated advisory circular. The JAA has a published 25.1322 ACJ (equivalent of an FAA advisory circular). The FAA does not have an AC associated with the alerting regulation, so the product resulting from the group for the FAA would be a revised regulation and a new AC. The current regulation was deemed as insufficient and thus the group is working towards expanding the scope of that regulation to apply beyond just the color of the lights (red for warnings, amber for caution, etc.). After the group submits the alerting regulation and AC to the TAEIG, the group will begin working on an update to the electronic displays AC (25-11).

Products:

1. Revised alerting regulation 25.1322
2. New alerting AC 25.1322
3. Revised electronic displays AC (25-11)

Major Milestones	Timeline
1. Major draft distributed for internal review	Dec 2002 ♦
2. 25.1322 regulation & AC submitted to TAEIG	April 2003 ♦
3. Begin work on electronic displays AC (25-11)	April 2003 ♦
4. Draft distributed for internal review to HF specialists	Sept 2003

Project 2: Human Factors (25.1301 New subparagraph e) Regulation & AC (Donovan)

This activity is part of the Human Factors ARAC Harmonization Working Group activity. The group was tasked to identify deficiencies in the part 25 regulations associated with human factors and flight crew error and develop appropriate material. After several years working on the identification and prioritization of the deficiencies, the group has been working on new regulatory material to partially address those deficiencies as part of 25.1301, as well as developing an associated new advisory circular. The current version of the AC has the following subject areas:

1. Flight crew error
2. Automation
3. Interface Integration
4. Non-essential equipment
5. Displays
6. Controls
7. Pilot Characteristics
8. Test and Evaluation Process

Products:

1. New Subparagraph to 25.1301 (e) to address human factors and flight crew error
2. New Advisory circular to address human factors and flight crew error

Major Milestones	Timeline
1. Draft rule and AC distributed for internal WG review	January 2003 ♦
2. Provide comments on AC and draft rule-rework as necessary	April 2003 ♦
3. Working group agrees to rule language	June 2003

4.	Last WG meeting to finalize rule and AC	October 2003
5.	Working group submits final material (regulation and AC) to FAA	Nov 2003

Project 6: TSO & MOPS: Moving Map with Ownship

(Donovan)

RTCA SC-181 working group 4, informally known as the “moving map Minimum Operational Standards (MOPS) working group”, completed the document published as RTCA DO-257 “Minimum Operational Performance Standards for the Depiction of Navigation Information on Electronic Maps” in September 2000. This document was developed to establish standards that could be invoked by an FAA Technical Standard Order to facilitate the certification of new moving map displays for situation awareness.

The new terms of reference chartered the group to “Revise DO-257, as necessary, to support the electronic depiction of airport surface situation awareness (SA) maps and vertical situation awareness displays. This should include requirements and guidelines for the electronic depiction of airport surface diagrams, ownship, ground path and vertical profile aspects of the display and associated controls.” Additionally the group was asked to develop a chapter with standards for moving map displays to be used during RNP operations to be included in the RNP MOPS.

Products:

1. New Technical Standard Order for Moving Maps
2. Updated moving map mops (RTCA DO-257A)
3. New chapter for RNP MOPS on map displays used during RNP operations

Major Milestones		Timeline
1.	RTCA Document sent to SC-181 for ballot (Final Review And Comment- FRAC)	December 2002 ♦
2.	Comments due from SC-181	Feb 10, 2003 ♦
3.	Initiate comment resolution and related changes to the draft	Feb 11-14, 2003 ♦
4.	TSO sent for AIR coordination	Feb 24, 2003 ♦
5.	Comments incorporated- new draft sent for final review	April 2003
6.	RTCA Meeting- Vote to accept final document	June 2003
7.	Final draft sent to RTCA PMC	July 2003
8.	PMC approves document?	Aug 2003
9.	TSO sent for public comment	Sept. 2003
10.	TSO revised based on comments	Nov 2003
11.	TSO published	Dec 2003

Project 7: Order: Addressing Human Factors for Avionics as Part of the TSO process (8100 series)

(Donovan)

Notice 8110.98 was drafted by an FAA/industry team as part of RTCA Task Force IV (Streamlining Certification). The document was published initially as a Notice to enable the field personnel to get experience using it and to provide some time for a critique. Since Notices expire in one year, the document needs to be re-worked to address comments and recommended changes and then published as a permanent FAA Order.

This notice provides guidance to facilitate the identification and resolution of human factors/pilot interface issues associated with complex, integrated avionics submitted for new or amended Technical Standard Order Authorization. This notice has three parts. The first is a suggested Federal Aviation Administration (FAA) process for evaluating the human factors/pilot interface avionics issues as part of the TSO process. The second is a discussion of some of the more prevalent, re-occurring human factors/pilot interface issues that have been observed during previous avionics TSO projects. The third is an appendix (Appendix A) which contains requirements and recommendations extracted from TSOs and advisory circulars to aid in issue resolution.

Products:

1. New Order based on currently published Notice 8110.98

Major Milestones		Timeline
1.	Put old Notice 8110.98 as an order in the Federal Register. Send directly to original RTCA TF IV team and key FAA players (test pilots, HF specialists, etc.) and industry representatives to solicit final comments.	April 2003
2.	Comments due	May 2003
3.	Disposition Comments and Change Draft	July 2003
4.	Submit to Tech Editor and Legal	August 2003
5.	Publish Order	

Project 12: Weather Displays (Policy Memo & MOPS)

(Donovan)

The policy memorandum was drafted by an internal FAA group. It intended to provide interim guidance for standardized use of the colors magenta, red, yellow, and or amber for cockpit display of weather information, given that concerns have also been raised over conflicts between the color usage guidance in RTCA Document, DO-267, *Minimum Aviation System Performance Standards for Flight Information Services - Broadcast Data Link*, and the published FAA Advisory Circulars on electronic displays. The guidance contained in this memorandum has been identified as necessary for near-term standardization of certification projects and is intended to be incorporated into a revision to RTCA DO-267, which will be invoked by a new Technical Standard Order (TSO) and Advisory Circular (AC).

Products:

1. New Policy Memo & Revised AC (?)
2. Revised RTCA Document-267

Major Milestones		Timeline
1.	Policy Memo submitted for AIR coordination & draft submitted to SC-195	January 2003 ♦
2.	Comments due	March 2003 ♦
3.	Policy Memo revised based on comments received	April 2003
4.	DO-267 Revised to incorporate Policy Memo	September 2003

Project 13: NEXCOM HF Roadmap

(Donovan)

This document presents a comprehensive plan to mitigate risks associated with human factors in the next generation air/ground communications (nexcom) system. The human factors plan for the nexcom system considers the system functions allocated to the human elements and the expectations and risks associated

with human performance of those functions. Three classes of human users are expected to make critical contributions to the system's performance: pilots, controllers, and system maintainers. This current version of the NEXCOM human factors plan focuses on the first segment of the FAA NEXCOM program and identifies human factors priorities for the 2002-2003 timeframe. The HFWG recommendations comprise a set of human factors activities focused on pilot, controller and technician functions and equipment, a sequence and timeline for their execution, and organization roles and responsibilities.

Products:

1. NEXCOM HF Roadmap

Major Milestones		Timeline
1.	Write Flight Deck sections of NEXCOM HF Roadmap	Spring 2002 ♦
2.	Coordinate drafts	Summer-Fall 2002 ♦
3.	Sign off Final Draft	April 2003

APPENDIX A
Summary of Communication Navigation Surveillance (CNS) HF Work

Communications (Wade)

<u>Type of Document</u>	<u>Topic</u>	<u>Focal Point</u>
1. Policy Memo, MOPS, AC 20-FIS	Weather Displays	Donovan
2. HF Roadmap	NEXCOM	Donovan*

Research funded FY 03:

1. NEXCOM Research project funded by AUA*
**These tasks are not being supported at this time*

Navigation (DeCleene)

<u>Type of Document</u>	<u>Topic</u>	<u>Focal Point</u>
1. MOPS & TSO	Moving Map	Donovan

Research funded FY 03:

1. Moving map research
2. RNP research funded in FY 02 and requested for FY 05

Additional Notes:

1. Colleen Donovan will be attending the SC-181 WG4 meetings (Moving Map MOPS)

APPENDIX B RESEARCH REQUESTS

This appendix contains research requested by the AIR-100 Human Factors Specialists (including Colleen Donovan, Bill Kaliardos, and Glen Gallaway as well as Dr. Kathy Abbott). Not all research requested gets funded. Requests must be submitted three years in advance, due to the congressional funding and budget cycle. Additional information is available about any project that has been funded. The table below reflects a list of titles. The following pages contains the actual research request. AAR-100 gets to determine which research organization gets each project (and the associated money). In addition to this research, AND funds human factors research requested by us on the NEXCOM program (noted in the NEXCOM Human Factors Plan, which Matt Wade has a copy of). We've also requested AND Safe Flight-21 for the ADS-B/CDTI work, which Bob Passman has a copy of.

This appendix contains excerpts from the Human Factors AAR-100 database (www.hf.faa.gov/db) which is currently in the process of being updated. Some requirements will be combined, others will be deleted. Thus, it is recommended that the reader only scan through this appendix.

Generally sponsors request research that will be beneficial to the projects and policy they are developing. Thus, the AIR-130 focal points have sponsored the following types of research:

- Kaliardos= EFB, RNP, & ADS-B/CDTI
- Gallaway = multi-function controls
- Donovan= moving map, job aid, & WX

Research Project Title	Sponsor	Funding Notes	Related To
1. Highway in the Sky/Synthetic Vision	Donovan	Requested for FY 04	NAV
2. Multi-function display/controls	Donovan	Completed	
3. Traffic Display Alerting (ADS-B) issues	Donovan & Kaliardos	Funded FY 03	SURV
4. Vertical Navigation/RNP Displays/Symbology	Donovan	ICAO Symbology Funded FY 03. Other tasks completed.	NAV
5. Weather Displays	Donovan	Funded FY 03	COMM
6. Human Factors Job Aid	Abbott & Boyd**	Funded FY01 -04	

** Note: Colleen is not currently listed as an official sponsor, but has been spending a significant amount of time recently coordinating union and AIR-500 issues on this project.

Specific Research Requests Grouped by Author Flight Technologies and Procedures

Requirements

Requirement ID: 900

Special Category: NONE

Sponsor Organization: AIR

Sponsor POC: Colleen Donovan - Kaliardos

Keywords: Alerting Systems, Annt/Mental Models/Cognition, Automation, Decision Making, Errors, Interface Design, Performance (meas/imprv), Safety, Situation awareness (SA), Workload

Title: Traffic Display Alerting (ADS-B) Issues

Research Statement:

Human factors research is needed to provide a capability for certification personnel to evaluate alerting functions on ADS-

B traffic displays. Specifically on developing and validating criteria for constraining false and nuisance alerts for cockpit display of traffic information avionics.291

Background:

The objective of this project is to develop and validate criteria for constraining false and nuisance alerts for cockpit displays of traffic information (CDTI), based on what is known about other alerting algorithms (ex. TCAS) and human performance issues with alerting systems, trust, situation awareness and workload. Where objective criteria are not possible, subjective means may be recommended provided they are established to be reliable and valid measures. These criteria are to be included as minimum requirements in the RTCA Minimum Operational Performance Standards document or an FAA Technical Standard Order for CDTI. Both of these documents are used by avionics manufacturers to develop their systems, and FAA aircraft certification specialists who evaluate the systems. The project should be focused on developing these objective and subjective measures as minimum certification criteria, based on research and data, for approving the Free Flight technologies known as Cockpit Displays of Traffic Information (CDTI). The CDTIs may be either stand-alone units or as part of an integrated ADS-B CDTI/Traffic Collision Avoidance System (TCAS). This research will span a period of three years, with three distinct phases. Each phase may be considered individually for support, but the latter phases will depend on successful completion of the previous phases. Phase 1 and the first year efforts will focus on data gathering and understand how similar issues were solved with other flight deck alerting systems, such as TCAS, enhanced ground proximity warning systems (EGPWS) and wind shear alerts. This phase will include exhaustive review of the certification standards, requirements and guidelines related to false alerts and alerting criteria published in RTCA MOPS and TSOs for the systems mentioned above. The background and basis for the currently published standards should also be examined, as well as research literature pertaining to human performance issues with alerting systems associated with situation awareness, trust, and workload. The interactions of these constructs will also be examined, with an objective of identifying common underlying structures or mechanisms. This will include a review and evaluation of the Aviation Safety Reporting (ASRS) literature associated with TCAS problems, as well as other TCAS issues in order to uncover lessons learned. Special emphasis will be paid to the three "key references" listed at the end of the paper, as a potential means to develop certification standards to enable the evaluation of traffic collision alerting systems (e.g., CDTI ADS-B, TIS, and TCAS). These key reference papers propose the use of Signal Detection Theory (SDT) methodology as a means to evaluate alerting systems and separate the impact of various decision biases. SDT can be used to study the impact of changes to the decision threshold, and also the impact of changes to the a priori base rate events in the real world. The authors of these key references establish the importance not only of high hit rates and low false alarm rates, but also of the importance of high posterior probabilities of a true alarm. Additionally, they also propose a means to access the impact of these changes, despite the fact that only a handful of airplanes are equipped with ADS-B/CDTI systems, and thus it is difficult to determine the base rate information for these events, which is required to determine the posterior probabilities. Thus, one path of pursuit towards objective criteria to evaluating the CDTI alerting system is by attempting to apply the methodologies proposed and developing recommended certification criteria for the alerting systems hit rates, false alarm rates, and posterior probabilities. This methodology may prove effective in developing objective criteria for evaluating the appropriateness of an alerting system on the "trust/use/misuse/abuse" dimension. Additional methodologies and criteria would need to be developed to evaluate the situation awareness and workload dimensions. Task 1: Documentation review: understanding the problem, determining what certification standards and alerting criteria exist for other alerting systems, in an effort to capitalize on lessons learned when developing minimum certification standards and criteria for CDTI alerting algorithms. 1) Obtain TCAS RTCA MOPS and TSO, as well as WAAS (RTCA DO-119B), enhanced ground proximity warning system (EGPWS), and wind shear. From each document, review sections on human performance/human factors alerting and false alert rate criteria and alerting algorithm. What is the criterion for a hit and false alarm? What studies are referenced to justify/explain the basis for the standards and criterion. Focus on alerting sections of all documents. 2) Identify TCAS researchers, software developers, etc to understand what had been done, why certain criteria were selected, and understand the alerting problems experience over the years with TCAS. Currently, the TCAS standards, and thus the TCAS avionics, have been revised seven times (we are now on TCAS Version 7) and an eighth version may be in the works. You will need to understand what, why, and how changes occurred to the alerting thresholds from version 1 - 7. What false alert problems did they have with the various versions, what was the impact on the operators (human performance issues that made the updates necessary) 3) Review ASRS database or any other database that contains TCAS incidents over the years (from the early versions of TCAS to modern day systems). Compile a list of human performance issues with versions of TCAS and associated key incidents/accidents that made the changes/updates required. Summarize what went wrong, was it corrected with a new version? What alerting issues exist today. What can we extract from this data to help us develop appropriate criteria for CDTI and other alerting systems. 4) Compare and contrast TCAS and CDTI alerting algorithms, functions, capabilities. What aspects of the TCAS alerting algorithms/criteria can we use directly for CDTI, what needs to be modified. Make recommendations for how we should move forward on developing certification standards to ensure we don't approve systems with these problems again (ex. Should we specify the CDTI alerting algorithms in the MOPS? Should we specify constraints on the false alert rate, as they do in the WAAS MOPS (RTCA DO-229B)? Recommendations for what those constraints might be for CDTI? 5) Identify CDTI researchers and software developers to determine how much human factors input has influenced algorithm. Did they incorporate lessons learned from TCAS? (note: I think this is part of item 2 – suggest combining it in the step above) (I put this as part of step 1 since it should help them get a sense of the types of requirements we are trying to end

up with- or hopefully, something even better) Year 2 1) Signal detection research and/or simulations to investigate what might be appropriate minimum certification criterion to constrain the false alert problem and/or develop/refine the alerting algorithm. Conduct signal detection simulations, similar to Kuchar's work on TCAS, to examine false alarm rates for CDTI. Also see paper by Krois to refine research/simulations. 2) Validate simulations in human subject experiment using MITRE's CDTI lab to determine whether the proposed alerting threshold/algorithm is appropriate for the cockpit alerting system. Test multiple scenarios in order to evaluate the algorithm in a range of operational tasks where TCAS had problems and CDTI might have problems. Year 3 1) Investigate air-to-ground alerting systems, applying lessons learned and methodologies developed in years 1 and 2.

Output:

1. Documentation review: a) empirical human factors results relevant to alerting systems, available in the public domain (journal articles, conference proceedings, and government reports); b) certification standards, requirements and guidelines related to false alerts and alerting criteria published in RTCA MOPS and TSOs for cockpit alerting systems; c) comparison of the alerting algorithms of TCAS, CDTI, CA, and URET d) previous ASRS analyses on alerting system related incidents to determine if yet another ASRS analysis is warranted; e) literature on human factors certification for guidelines for development of certification criteria for CDTIs; f) identification of other data sources (e.g., from demonstrations and simulations or from operational environments) that would allow for further examination of relevant human factors issues outside of a laboratory. 2) Examination of the roles of cockpit alerting systems. This subtask will examine the roles of a number of automatic alerting systems (GPWS, TCAS, wind shear alert) and the impact of these on the respective certification criteria of the alerting systems. 3) Development of measures and criteria for collision avoidance system evaluation. This subtask involves a comprehensive evaluation of available measures of machine, human, and human-machine system performance as they pertain to collision avoidance systems, identification of primary and secondary measures, and evaluation of empirical support for the latter. 4) Develop designs and protocols for experiments. Based on findings from the literature review, we will develop experimental designs and protocols aimed at investigation of the most critical issues relevant to human factors certification of CDTIs and to address possible controversies in the alerting system literature.

Regulatory Link:

Surveillance (ADS-B/CDTI) Advisory Circular.

Flight Technologies and Procedures

Requirements

Requirement ID: 621

Special Category: NONE

Sponsor Organization: AIR

Sponsor POC: Colleen Donovan

Keywords:

Title: Vertical Navigation/RNP Displays/ Symbology

Research Statement:

Human factors research is needed to support development of minimum certification requirements and guidelines for the approval of new moving map displays depicting surface situation awareness, vertical profile navigation information, and required navigation performance. This also includes the need for research to evaluate and identify human factors issues with symbology being proposed for use on these displays to support the ICAO symbology committee intending to standardize these symbols. Minimum certification requirements and guidelines is intended to go into an RTCA SC-181 MOPS, an FAA TSO on moving map RNP/RNAV vertical navigation displays, and the symbology results will feed into an ICAO document. 714

Background:

New moving map displays are being proposed for certification. These displays include information that is for situation awareness. It is important to understand the potential impact of this information on the pilot, as well as determine what certification requirements are appropriate. The research is needed to facilitate aircraft certification specialists in the identification and resolution of human factors/pilot interface issues with new moving map displays including required navigation performance displays, vertical profile situation awareness displays, and surface situation awareness (airport surface map) displays being proposed by manufacturers such as Honeywell, Rockwell Collins, Avidyne, Smiths, Sandel, etc. This guidance should include certification minimum requirements and design guidance, based on research and usability assessments of new and emerging display systems.

On-Going Project Entails: Vertical Navigation display work- guidelines and recommended practices for display manufacturers and to certify the equipment. Issue: many avionics vendors are working on developing vertical navigation and/or 3-D displays- need a literature review of existing material- produce summary guidelines and minimum certification requirements. Research program should entail experimental testing of displays that simultaneously present top down (plan) and side ways (profile) views- similar to the two views on instrument approach charts. Additionally looking at either display mode alone. Look at issues related to Boeing vs. Airbus use of colors when these displays are combined with terrain and/or weather. Pay attention to depiction of RNP information (RNP bubble, status, and alerting) particularly on vertical dimension. Primarily avionics research to support AIR in the revision of the moving map MOPS/TSO to include requirements for RNP displays with vertical guidance. Provide recommendations for what works and doesn't work in GPS/RNAV/VNAV displays. Multi- year program.

Additional related tasks: Examination and evaluation of depicting ICAO vs. SAE recommended symbology in electronic format. Issues with depicting that symbology on low-end GA displays and also on vertical navigation displays. Discriminability of symbols.

Conduct research to resolve path mode issue in profile displays applied to the RNP environment and develop application to certification tool. Deliverables: Research Report; Certification tool for evaluation of path mode representation in profile navigation displays.

Priority: Priority Criteria: Internal= 3 Human Factors Guidance to support development of RTCA MOPS & FAA TSO on moving map RNP/RNAV vertical navigation display.

Reduce Accidents= 2 (Useful)

External= 3 (Important- The program supports resolution of safety issues required to develop policy as identified in REDAC, ARAC, RTCA, etc, Committees. NOTE: RTCA);

New Technology= 3 (Support for new technology= Important- "allows FAA/AVR to respond in a timely fashion with solutions or procedures for expected new technology")

Output:

Industry Review Report. Report documenting results of usability assessment, with human factors/pilot interface issues, requirements and design guidelines.

Regulatory Link:

Moving Map TSO and RTCA DO-257 update.

Flight Technologies and Procedures

Requirements

Requirement ID: 619

Special Category: NONE

Sponsor Organization: AIR

Sponsor POC: Colleen Donovan

Keywords: Interface Design, Situation awareness (SA), Weather

Title: Weather Displays

Research Statement:

Human factors research is needed to develop minimum certification requirements and recommendations for evaluating the depiction of weather information on flight deck displays as well as to develop a certification usability assessment methods/tool. 248

Background:

A plethora of new weather information is being proposed to be depicted in the flight deck that was previously only available on the ground. This includes real-time graphical information such as graphical metars, winds aloft, precipitation, and NEXRAD data. Concerns about how this information is presented, in isolation and combination, have been raised. Questions such as 'when is the data too old and needs to be removed from display, how is the age of the data depicted? Does it need to be depicted? What about merging data of different ages on the same display, different orientations (north-up vs. track up) displayed concurrently? Color issues, symbology issues? Depicting this information concurrently on a display with non-weather data?

Research is needed to identify the current and emerging human factors pilot interface issues and to develop appropriate requirements and guidelines for the Aircraft Certification Specialists who must evaluate and approve these systems. This guidance should include certification minimum requirements and design guidance, based on research and usability assessments of new and emerging weather displays, regardless of the platform (multi-function display systems, electronic flight bag, etc.). *On-Going Project Entails:*

Update to previously submitted industry product review- including review of existing design conventions. Review of draft weather display requirements and recommendations (in DO-267 and FIS-B advisory circular). *Outyear work:*

1) Usability assessment of avionics to determine current human factors/pilot interface issues with existing and prototype systems, in order to develop minimum certification requirements for the approval of these systems.

Outyear work:

Priority: Internal 3= Important= "implement JSITs"

Potential to Reduce: 4= Program responds to immediate aviation issues that have direct operational safety impact and is identified in an approved JSIT. Note: GA Weather JSIT identified the need for weather displays in the cockpit and streamlined certification of these avionics. Recommendation 1: Provide better information to pilots on the location and severity of weather hazard areas, and better methods of using weather information to make safe decisions on how and when to make a flight.

The greatest proportion of fatal, GA weather accidents can be eliminated by implementing the functional group of interventions contained within this recommendation as a group.

; Produce, and make operational, graphical weather information products that show how and when flights can be made

Draft
March 31, 2003

safely.

; Improve the PIREP collection / dissemination system with a common database for controllers, pilots, FSS specialists and dispatchers.

Improve certification to accelerate the equipage of GA aircraft with low-cost avionics for data-link display of weather graphics."

External: 2= Useful

New Technology: 4= The program is required to support development of FAA/AVR policy, rules, TSO's, AC's. Note: work required to support new weather display TSO (via RTCA document) and advisory circular. WX will be data linked up. Certification part of Capstone avionics package.

Output:

1) Industry review product report. 2) Usability assessment report documenting potential issues. 3) Issues list which certification specialists can use to develop certification issue papers. 4) Edits/recommendations to draft requirements and guidelines (DO-267 and FIS-B Advisory Circular).

Regulatory Link:

FIS-B Advisory Circular, new weather displays Technical Standard Order (draft) and RTCA DO-267A (to be referenced by TSO)

Flight Technologies and Procedures

Requirements

Requirement ID: 808

Special Category: NONE

Sponsor Organization: AIR

Sponsor POC: Colleen Donovan

Keywords:

Title: Highway in the Sky/Synthetic Vision

Research Statement:

Research is needed to investigate human factors/pilot interface issues with proposed highway in the sky and synthetic vision systems proposed by Universal Avionics, NASA, Rockwell Collins, and others in order to assist the aircraft certification specialist identify and resolve (determine acceptable means of compliance) with these issues.337

Background:

Aircraft certification specialists are currently being asked to review and approve new highway in the sky/synthetic vision systems, which may be "for situation awareness only" but be placed in a compelling area of view, such as the pilots primary field of view. This includes the Universal avionics system, the NASA system, and a Rockwell Collins system with functionality well beyond what has been approved in the past. Serious potential consequences may arise if the aircraft specialists approve something that should not be approved. To date the FAA has no published guidance on human factors issues with these types of systems in order to determine what is acceptable and what is not. This material needs to be data driven and research is need to identify potential issues and resolutions.

Output:

1) Research report documenting potential human factors/pilot interface issues.
2) Issues list- to be used for generating aircraft certification issue papers 3) Industry Product Review - including descriptions of what is being developed and presented by industry in this area

Regulatory Link:

AC 25-11 and 23.1311-1A (both are about to be updated, and should include appropriate guidance material for synthetic vision systems)

Draft
March 31, 2003

Draft
March 31, 2003

Flight Technologies and Procedures

Requirements

Requirement ID: 611

Special Category: NONE

Sponsor Organization: AIR

Sponsor POC: Colleen Donovan

Keywords:

Title: Multi-Function Display/ Controls

Research Statement:

Human factors minimum requirements and design guidance is needed to update FAA Technical Standard Order (TSO) C113 on multi-function displays. This guidance includes certification standards to be used by aircraft certification specialists reviewing new multi-function avionics with novel features for which no FAA certification guidelines exist including: displays which concurrently multiple information such as display weather, traffic, navigation information etc. Guidance is also needed to support flight standards in determining what types of operational approvals should or should not be granted based on usability of the system, workload issues, etc. Items to be considered: guidelines for each feature and function of typical MFD's currently on the market and likely to be on the market in the near future (as identified by manufacturers or at public functions such as Oshkosh where they demonstrate prototype systems). Sample research questions: identify issues and potential consequences of various possible combinations such as when you have red traffic on top of red terrain, on top of red weather? What should the FAA approve or certify for use? What happens when you have TCAS and ADS-B alerts being indicated simultaneously- what should our certification requirements be? Additional tasks requested by AFS for potential consideration in FY03 and beyond: Examine issues and make recommendations for clutter/declutter, color usage, use of display for primary flight information, reversion, emergency annunciations, and display switching. Provide recommendations for prioritization of displayed data relative to operational mode, or phase of flight. 1677

Background:

This research will contribute to the revision of FAA Technical Standard Order (TSO) C113 on multi-function displays, which is out of date and in need of revisions based on current technology and information requirements. This is a critical project, which is part of the AIR business plan, but it is not currently being adequately supported since SAE G10 is voluntary and the group membership is not adequate. Future research is expected to follow in order to follow-up and provide additional guidance in areas where not enough is known or based on certification needs (ex. requested for combined system with both TCAS and ADS-B traffic alerts, etc.). Additional Out-year work: Multi-function controls work (controls used for multiple things). Needed- lit review and research on cursor control devices (touch pad, touch screen, track balls, mouse, etc.) and multi-function controls. Need compilation of best practices and minimum certification standards- including a list of issues for certification to consider when reviewing these various input devices. Priority Criteria: Internal= 4 (AIR Business Plan Item III.A.2 "Submit policy memo on Human factors guidance for RTCA Avionics MOPS and FAA TSO's for AIR coordination." Policy Lead= Colleen Donovan); Potential to Reduce Accidents= 2 (Useful= "The program provides indirect support to accident reduction initiatives and expands the knowledge base in support of accident/incident prevention or mitigation initiatives." Note: it would indirectly support this by having good HF guidance up front- in the product design); External= 3 (Important- The program supports resolution of safety issues required to develop policy as identified in REDAC, ARAC, RTCA, etc, Committees. Note: This policy would be the HF policy for all new avionics TSO's and RTCA documents); New Technology= 3 (Support for new technology= Important- "allows FAA/AVR to respond in a timely fashion with solutions or procedures for expected new technology")

Output:

This should not be considered for funding in FY-03 or afterwards. Multi-function controls item split out as a new requirement.

Regulatory Link:

TSO C-113

Flight Technologies and Procedures

Requirements

Requirement ID: 623

Special Category: NONE

Sponsor Organization: ANM

Sponsor POC: S. Boyd & K. Abbott

Keywords: Automation, Errors

Title: Certification Job Aid

Research Statement:

Human factors research is needed to provide a capability for certification personnel to evaluate flight deck designs for susceptibility to design-induced flight crew errors and the consequences of those errors as part of the type certification process.²⁵²

Background:

Research task: Develop human factors job aid for use by certification personnel. FY 01 tasks: - add additional Part 25 guidance such as TSOs, MOPS and other industry standards - identify human factors issues related to the certification of flight deck controls - add functionality such as search, notes, issue paper template, update of FARs Ranking Criteria: Internal drivers: Essential. On the AIR Business Plan for FY01 and may be on the AIR plan as well. Potential to reduce accidents: Important. The Job Aid supports flight deck design certification. Flight decks designed and certified without undue potential for flight crew error is the first line of defense in accident prevention. External drivers: Important. Supports ARAC HF HWG activities. New technology: Important. The Job Aid will provide relevant human factors information which will support the certification of new technologies. Note: Directly supports Change Area II (Human Factors Integration) of Certification Process Study implementation.

Output:

Support tools for certification personnel to identify HF issues.

Regulatory Link:

Supports integration of HF references with Part 25 regulations, advisory circulars, and TSO on displays.